

**Course Number:** V63.0270

**Time and Location:** TuTh 3:30pm–4:45pm in Silver 507

**Course Website:** <http://cims.nyu.edu/~lagatta/class/fall/geometry> (and Blackboard)

**Instructor:** Dr. Tom LaGatta

**Office:** 927 Warren Weaver Hall

**Office Hours:** TBA (also by appointment)

**Office Phone:** 212-992-9920

**Email:** [lagatta@cims.nyu.edu](mailto:lagatta@cims.nyu.edu)

**Instructor Website:** <http://cims.nyu.edu/~lagatta/>

**Required Text:**

- *Modern Geometries, Non-Euclidean, Projective and Discrete*, by Michael Henle. Second Edition, Prentice Hall, 0-13-032313-6. Amazon Bigwords (approx. \$40 used)

**Course description:**

This is a course in Modern Geometry from an algebraic perspective. We will make an axiomatic and algebraic study of Euclidean, non-Euclidean, affine, and projective geometries. Throughout, Felix Klein's *Erlanger Programm* will be the central theme in the course: the various branches of modern geometry are united under the framework of projective geometry, and we use group theory to classify the symmetries of these different spaces. For example, the Euclidean plane is invariant under translations and rotations, the 2-dimensional sphere is invariant under 3-dimensional rotations, and the hyperbolic plane is invariant under Möbius transformations. Our applications of these ideas will be quite varied, from the symmetry of crystals and Einstein's theory of relativity to examples in contemporary art.

**Topics:**

- Background: complex numbers, geometric transformations, the *Erlanger Programm*
- Plane Geometry: Euclidean geometry, hyperbolic geometry, spherical geometry
- Projective Geometry, Solid Geometry, Discrete Geometry, Axiom Systems
- Cultural Impact of Geometry, Geometric Ideas of Space

**Recitation Section**

**Time and Location:** Th 4:55pm–6:10pm in room 435 of the Waverly Building (24 Waverly Pl.)

**Teaching Assistant:** Giulio Trigila

**TA's Office Hours:** TBA

**Grading Policy**

**Homework (18%)** Homework will be due *every Friday by 5pm*, and must be submitted in my mailbox in Warren Weaver Hall (not in class nor recitation). Each week's assignment will be posted on the course website. Late homework will not be accepted for any reason; however, when I compute your final grade I will drop your lowest homework score. Homework is worth 18% of your final grade.

**Quizzes (6%)** There will be three graded quizzes throughout the semester, on *Tuesday, September 20*, *Tuesday, October 4* and *Thursday, November 10*. *Quizzes will start at the beginning of class*. Each of the three quizzes is worth 2% of your final grade.

(continued)

**Midterm Exams (40%)** There will be in-class midterm examinations on *Thursday, October 13* and *Thursday, November 17*. I will give make-up exams only in exceptional circumstances (e.g., death in the family, outbreak of mono). Please notify me far in advance. Each midterm exam is worth 20% of your final grade.

**Final Exam (30%)** The cumulative final examination for this course is scheduled for *Thursday, December 22* from 4:00pm to 5:50pm. The location will be announced in advance. The department will not be able to accommodate early finals for non-academic, non-emergency reasons. *Plan your travel schedule accordingly.* The final exam is worth 30% of your final grade.

**Essay (6%)** Six percent of your final grade will consist of a 3–6 page (single-spaced) essay exploring a topic of your choosing related to geometry. To think critically about essay-writing in a math class, I recommend you read Paul Graham's *The Age of the Essay*. An excerpt:

An essay doesn't begin with a statement, but with a question. In a real essay, you don't take a position and defend it. You notice a door that's ajar, and you open it and walk in to see what's inside.

First, you must submit a 2-paragraph essay proposal (due *Friday, October 21*). This should include a *very specific* question or idea which you wish to explore, and an explanation of how this question or idea ties into your major, your interests, and/or your career goals. Section 27 of Henle's book includes many questions rooted in philosophy and art; I can provide many more applications to the physical and social sciences. It will be much easier to write a good proposal if you meet with me for 10 minutes. Come to my office hours or make an appointment and let's chat (or send me an email).

A rough draft of your essay is due 3 weeks later. I expect you to treat the rough draft as if it were the final paper. Good grammar, sentence structure and spelling are mandatory. You are an adult, and I expect you to write like one. I will give you a letter grade for your rough draft, which will then count as 1 homework grade.

**Formatting for Rough Draft:** 12pt, serif or sans serif font; 4–8 pages *double-spaced* (so I have room to make comments). Due *Friday, November 11*.

The final essay is due at the end of the last week of classes. The essay should be 3–6 pages long, single-spaced & justified, with space between paragraphs. Your paper must not be double-spaced; that's fine for a draft, but not a final copy. Again, good grammar, sentence structure and spelling are mandatory. You will receive a letter grade based on my subjective reading of your paper, which will then be worth 6% of your final course grade.

**Formatting for Final Essay:** 12pt, serif or sans serif font; 3–6 pages *single-spaced and justified*, with space after paragraphs for readability (precise length: 1350–2500 words). Due *Friday, December 16*.

I will be using Turnitin to ensure the originality of your essay, and the NYU Policy on Academic Integrity and Plagiarism will apply.

### **Grade Distribution**

A grades: 90–93 (A-), 93–97 (A), 97–100 (A+);

B grades: 80–83 (B-), 83–87 (B), 87–90 (B+);

C grades: 70–77 (C), 77–80 (C+);

D grades: 60–67 (D); 67–70 (D+);

Failing grade: 0–60 (F).

*Exam Safety Net:* If you show up to a midterm or the final exam and put in a “reasonable effort” (to be determined subjectively by me), then I will guarantee you a minimum grade of 48% for the exam. This is still a failing grade, but it's much better than a catastrophic failure. *The three exams combined are worth 70% of your final grade.* I do not want a failure on one exam to jeopardize your entire standing in this course.